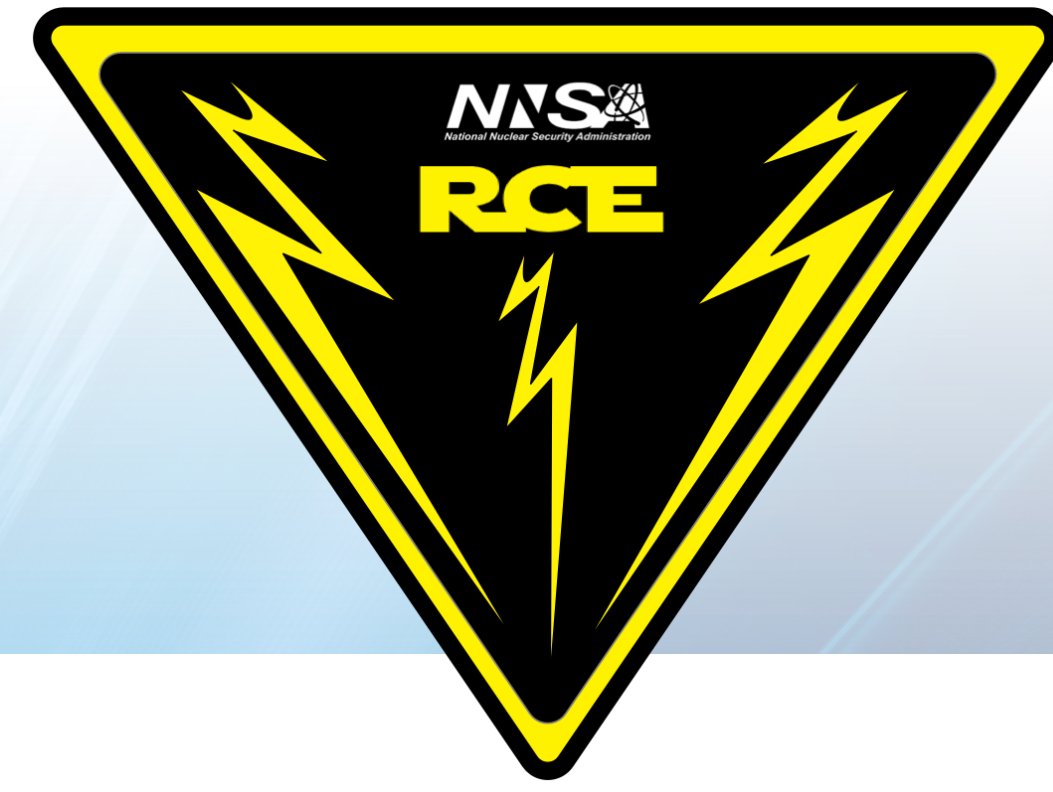


Remote Computing Enablement: A Force Multiplier for NNSA HPC

Muti-institutional world-class HPC service providers uniting around shared goals

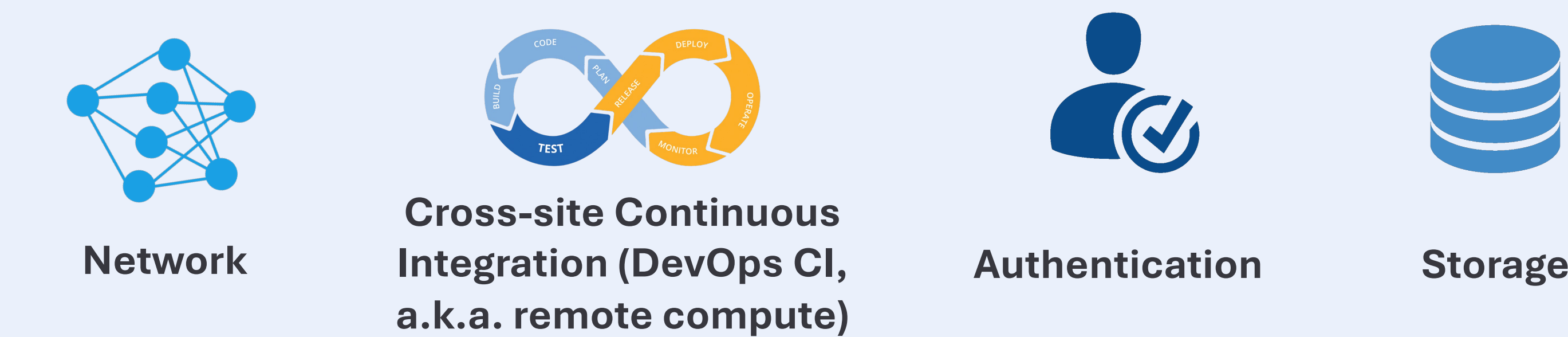
Todd Heer (LLNL), B. Santos (LANL), J. Stevenson (SNL), H. Sidhu (LLNL), J. Martinez (LANL), J. Maurer (SNL), J. Consolati (LLNL), N. Jones (LANL), A. Warren (SNL), et al.



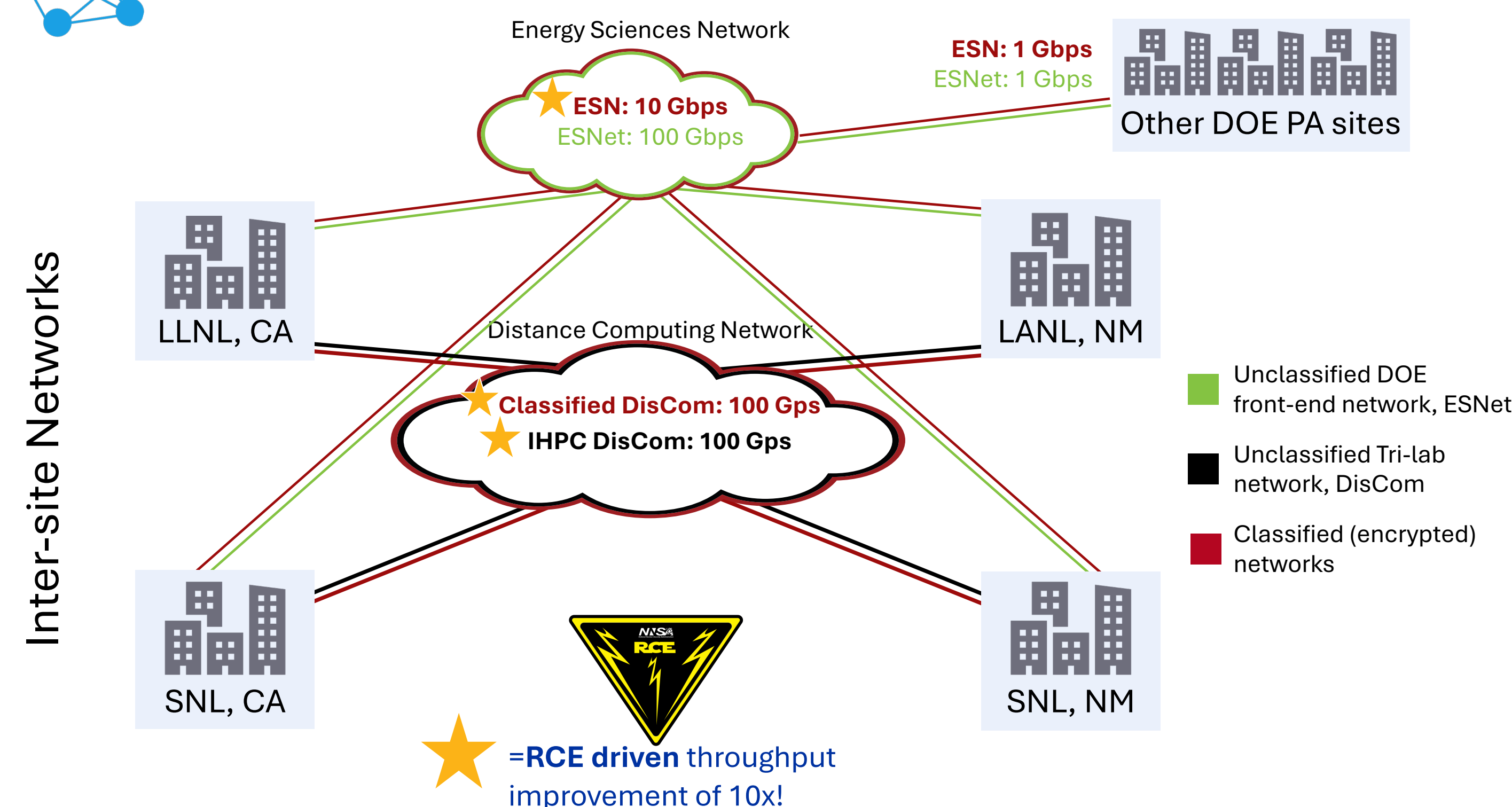
Since 2019, RCE's goals have been to achieve a remote HPC user experience as good as the local experience, increase simplicity and function, and fully utilize resources across NNSA laboratories. More than **50 Tri-Lab SMEs** have participated.

Multi-site Communication Mechanism for HPC Infrastructure Experts Delivering Awesome NNSA Simulation Capabilities

Four first-order initial pillars:



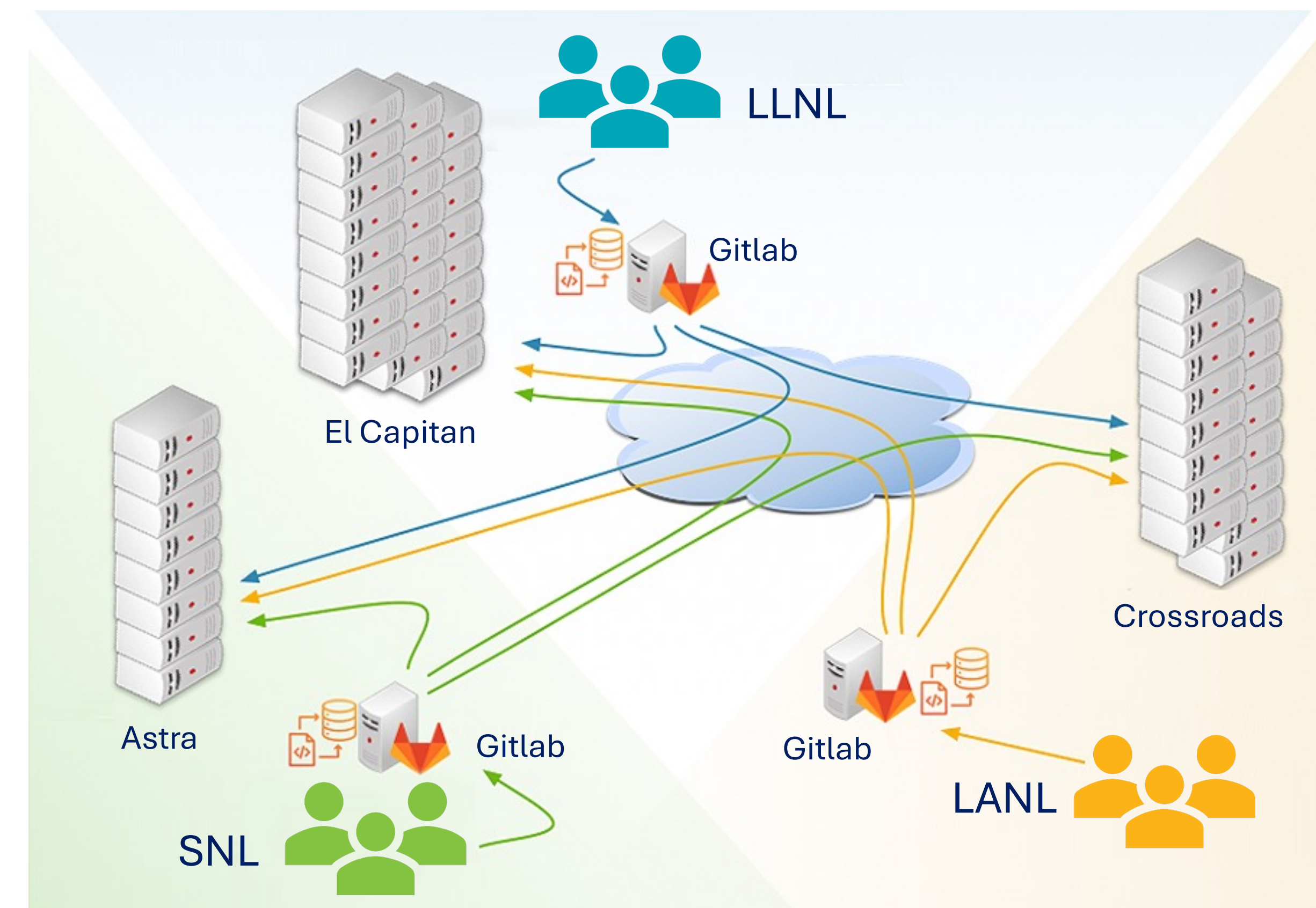
Inter-site HPC Networking Improvements



- Improvements with CAPEX investments of **~\$3.4M over 5 years**

Cross-site CI: Remote Computing from Local Code Repository

- Physics and engineering simulation code developers use home repositories to compute remotely
- Each Tri-Lab HPC site uses their own GitLab instance for code repo and pipeline workflow duties
- A key for success: each site maintains their own identity provider infrastructure; novel solution pivoting authentication around DOE OneID
- \$425k/yr development contract** for DOE GitLab functionality upstream



Using local code repositories, HPC simulation scientists can pipeline compute jobs locally or remotely.

RCE Seeks “Bang for the Buck” Opportunities

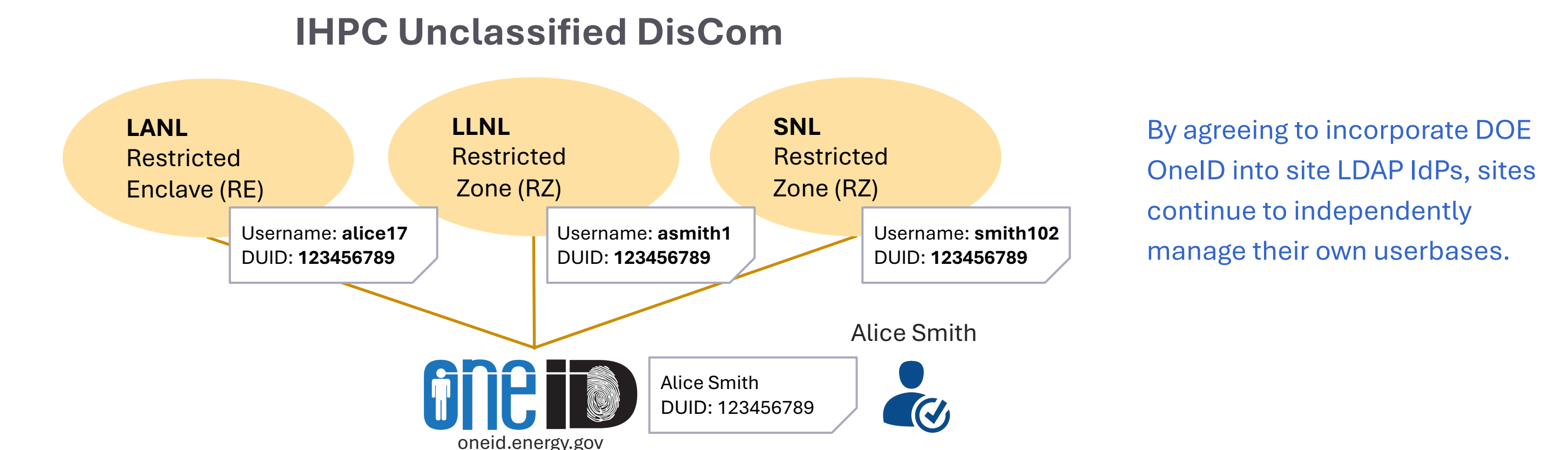
Projects can be big initiatives or simpler opportunities to ease users' burdens

- Removed painful-to-use gateways requiring multiple interactive authentication
- Routed traffic destined for remote web “store fronts” directly to the servers
- Highlighted the importance of Virtual Network Computing (VNC) to preserve desktop sessions

Cross-site Authentication

Enables inter-site brainstorming for security authorizing officials alongside SMEs

- Service Level Agreement – sets cross-border authentication expectations (e.g., multifactor auth, 30-day lifetimes) along with services firewall ports
- Cross-realm Kerberos KDC trust (e.g. LANL HPC Kerberos credential works at LLNL HPC)
- DOE-wide OneID DUID (a unique human identifier) agreed upon as a key to pivot around for local authentication and authorization for cross-site CI



Conclusions

- Multi-site agreements are more easily reached when models are distributed and not centralized (authentication, network architectures, etc.)
- Aligning on infrastructure technology when it makes sense allows for greater economies of scale, e.g., negotiated GitLab licensing 71% off list, **LLNL savings of \$1.54M/yr**, as well as broadening SME “teams”
- LLNL brings technical expertise running the world's fastest supercomputers, fostering top-tier vendor relationships, and efficiently leveraging multi-lab procurement vehicles (e.g., lowest burden rates of 6%) on behalf of the NNSA

Next Steps

- Expand recent full deployment of IHPC data transfer clusters with ubiquitous WAN data transfer utilities
- Design Tri-Lab single namespace of distributed storage showcasing no need for users to transfer data, it just appears at all three sites

RCE enables subject matter experts to collaborate and build connections, amplifying expertise and driving innovation across lab boundaries